TEACHER EVENT CHECKLIST
EARTH ACCORDING TO WORF

Date Completed	PRE EVENT REQUIREMENTS
	1. Print out 1 copy each of this entire .pdf file (color copy preferred). Please note: this document is 14 pages long.
	2. Sign Agreement to Participate and fax to the Distance Learning Outpost at (281) 483-3789.
	3. Have students take Pre-Event Quiz on page 11.
	4. Complete all Pre Event Activities on pages 5 to 10 with the students.
	5. Teacher to fax or E-mail (preferred) a minimum of 5 student questions to our office no later than 3 business days prior to your event. (See page 10)
	6. Review NASA Event Guidelines on page ? with students.
	DAY OF EVENT ACTIVITIES
	1. The students will be asked to share their results from their pre-work activities with the NASA DLO presenters.
	POST EVENT REQUIREMENTS
	1. Have students take Post-Event Quiz on page 11 to demonstrate knowledge of subject.
	2. Teacher(s) and students to fill out event feedback. (See page 13)
	3. Distance Learning Outpost will respond to any follow-up questions.
	4. Students to complete extended activities on page 13 at Teacher's discretion.

Teacher(s) Agreement To Participate
NASA Johnson Space Center
Distance Learning Outpost

I have reviewed the Earth According to WORF Learning Module and agree to complete all of the required activities with my students, both prior to, and following, the video teleconferencing event.

Teacher(s) _____

School/Institution _____

Event # _____

Date of Event _____

Instructional Goal:

Upon successful completion of this learning module, students will be able to analyze images from space, relate it to geography and apply the acquired information to predict future outcomes.

Learning Objectives:

1. Students will be able to define geography and how geographers use it to answer questions about physical and human interactions.

2. Students will be able to use interpretive skills to identify observable characteristics that provide new insights and understandings about the physical and human aspects of our planet.

3. Students will be able to compare changes between two images from the same location at different time periods and predict future outcomes.

National Science Standards (NSTA)

Science As Inquiry (K-12)
Abilities necessary to do scientific inquiry
Understandings about scientific inquiry

Earth and Space Science (K-4)
Changes in earth and sky

Science and Technology (K-12)
Understandings about science and technology

Science in Personal and Social Perspectives
(K-4)
Characteristics and changes in populations
Changes in environments
(5-8)
Populations, resources, and environments
Natural hazards
Science and technology in society
(9-12)
Population growth
Natural resources
Environmental quality
Natural and human-induced hazards

History and Nature of Science (K-12)
Science as a human endeavor

WORF: World Observation Research Facility

The goals of the WORF Program are to provide a facility in the U.S. Laboratory Module of the International Space Station to support Earth Science research and contribute to the NASA Earth Science Enterprise to further Earth Science and Remote Sensing applications, research, technology, and commercial efforts.

Grade Level:

Grades K-12

Time requirements:
3 - 4 class periods
1 – Fifty (50) minute video teleconference

National Geography Standards (K-12)

The World in Spatial Terms
Standard 3: How to analyze the spatial organization of people, places, and environments on Earth's surface.

Places and Regions
Standard #4
Identify and analyze the physical and human characteristics of places.
Standard #5
The similarities and differences among regions

Physical Systems
Standard #7
The physical processes that shape the patterns of Earth's surface

Human Systems
Standard #12
The processes, patterns, and functions of human settlement

TEXAS EDUCATION KNOWLEDGE AND SKILLS (TEKS)

	Science	English	Geography
(Grades K - 4)	K.2.D,E K.5.B 1.10.A 2.7.A 2.2A 2.2E 3.2C 3.2D 3.6.B 4.10.A	**LA** 2.15.C 3.18.C	K.5.A 1.6.A 2.7.A 2.8.B 3.4.A 3.4.C 4.7.B
(Grades 5- 8)	5.11.A 5.12.A 6.6C 7.14.A 7.14.B 8.14A 8.14C	5.15.C 6.15.C 7.15.C 8.15.C	5.7.B 5.8.A 6.6.A 7.9.C 8.11.B
(Grades 9-12)	**Environmental** 112.44.8.A	**LA – Writing** 110.42.b.1.A	

OVERVIEW

Geography is the science of space and place on Earth's surface. Its subject matter is the physical and human phenomena that make up the world's environments and places. Geography asks us to look at the world as a whole, to understand the connections between places, and to recognize that the local affects the global and vise versa.

Natural and Man-Made features on the Earth's surface typically will demonstrate a characteristic color, shape, and pattern that will become familiar to observers and investigators. These observable characteristics will help us make decisions about where to live, where to build, how to plan our future, and how to keep our planet and ourselves healthy. These visual and interpreted images can provide us with new insights and understandings about the physical and human aspects of our planet.

Students will be exposed to the skills of interpretation used with space-based imagery taken aboard the Space Shuttle and the International Space Station. During the interactive videoconference students will apply those skills to related images and attempt to explain the observable conditions in those images.

INSTRUCTIONAL STRATEGY

Pre-VTC Classroom Component

Class #1 (Grades K-12)

1. Inform students that, with the help of NASA, they are about to experience a new way of looking at geography. They will use images taken by NASA to study geography, just like NASA scientists do. The lesson will also include a live video teleconference with the NASA Johnson Space Center so that NASA can teach them how to look at the photographs the same way earth observation scientists do.

2. Students to take Pre-Event Quiz on page 11 to test their knowledge prior to these lessons about Microgravity. Students keep these quizzes on file to compare to their Post-Event Quiz.

3. Ask students about their perceptions of geography. For example, ask the question, "what do you think when you hear the word 'geography'?" (Field responses from the students without trying at this point to correct any misconceptions.)

4. Define geography as a class. Webster's Ninth new Collegiate Dictionary defines geography as:

   "A science that deals with the earth and its life; esp: the description of land, sea, air and the distribution of plant and animal life including man and his industries?"

   Geography for Life: The National Geography standards say the following about geography:

   "*Geography is* the *science of space and place on Earth's surface. Its subject matter is the physical and human phenomena that make up the world's environments and places…"*

   Continue the dialogue with students by asking, " What would you think if I said geography is really about asking questions and trying to answer them?" Demonstrate by posing some of the following questions:

   1. Why do you think (name of your city) is located here . . . . Why did people decide to build a city here?"
   2. What was this area like before people settled here and built the town?
   3. How has the city being here changed the environment?
   4. Do things that happen here affect people in other places?
   5. What about the other way around? Do things that happen elsewhere affect us here?
   6. Can this area support a larger population?

5. Explain to students that the study of geography involves asking questions about physical and human interactions, such as those in the question above. Initiate a discussion by asking the students what tools a geographer might use to ask and answer questions. The obvious include maps, drawings, photographs, aerial photography, satellite images, eyewitness descriptions, sketches, and public records such as information collected by the US Geological Survey, US Census Bureau, Chamber of Commerce, etc.

6. Next, explain that images of the earth's surface taken by astronauts on the Space Shuttle and Space Station are another tool geographers use. In fact, NASA has its own geographers who look at these images, analyze them, and post information on the internet for people who make important decisions about where to build new buildings, how to vote for public projects, how to plan for the future, and much more.

7. The next activity will give them a start at becoming NASA geographers.

ACTIVITY #1
(Grades K-12)

Materials

- Photographs from home

Procedure

1. To get your geographers ready to analyze images, do this activity.

    a. Have them bring in photographs of their families or events in their lives. (You can bring in postcards to add some other types of pictures to the group.) Be sure their names are on the back of the photo.

    b. Talk about the details of the pictures and discuss the details and what information they give you.

        For example: In the pictures below, ask the students if they can tell you what season it might be and how they came up with that answer. What other information can be drawn from the details? Could you get as specific as whether or not those types of flowers are grown in certain areas? What about the boys wet hair and what type of water is behind him? Do they have swimming pools everywhere in the world?

2. Now that the students are in the mode of analyzing photos, let's learn some specific skills that will assist them as they look at the photos taken by the astronauts in space. In the next class activity they will begin to look at the photos taken by astronauts in space and identify geographical features using color, shapes, and patterns.

Activity #2a
(Grades K-4)

THE ADVENTURES OF ECHO THE BAT
Ordering information for the book is located below under **CORE CATALOG** below.

Materials
- Echo the Bat book

OR
- Computer with Internet access

Background
This picture book of Echo the Bat teaches the concepts of remote sensing throughout a story of a young bat lost in Arizona. Pop-up images are incorporated into the satellite images to assist the child in recognizing land features narrated in the story. The book is accompanied by a set of activities that reinforce four basic themes or concepts fundamental to the interpretation of satellite imagery: perspective, shape and pattern, color, and texture. Activities and activity sheets are provided on the companion web site listed below.

Procedure
You may not receive the book in time to complete this activity with the book in your classroom before the NASA event but the website will provide useful information for before and after the event.

The Adventures of Echo the Bat Website – Computer needed (Grades K-4)
http://imagers.gsfc.nasa.gov/k-4/index.html
This website provides activities for your students along with a teacher's guide.

CORE CATALOG
http://catalog.core.nasa.gov/core.nsf/5f9c4a5adae3d29e8625670d004edb64/c93b8230e3e34fda86256ac70058634b?OpenDocument. This link gives you details about the book. You can click on HOW TO ORDER at the top to order the book.

Activity #2b
(Grades 3-12)

Materials

- Computer with Internet access

Procedure

1. Inform the class that they are going to look at some of these pictures and learn just how valuable a geography tool they can be. Explain that they will do this as team, and then divide the class into five small groups.

2. The interpretive skills we would like your students to explore are Color, Shapes, and Patterns. What are the observable characteristics that will help your students recognize certain natural and man-made objects and then allows them to interpret the conditions observed in these Images from Space?

   Color – Vegetation, Ocean, River, Lakes, Man-Made Objects (cities, roads, bridges)
   Shapes – Coastlines, Rivers, Lakes, Mountain Ranges, City (homes vs. work buildings)
   Patterns – Man-Made vs. Natural structures and objects.

3. This activity from EarthKAM enables the students to choose different geographical features and become familiar with what they look like in the pictures from space.
   http://www.earthkam.ucsd.edu/public/students/activities/landformations/

   The students can click through on their own or you can direct them and discuss each picture. During the event with the DLO, similar pictures will be shown and the students will be asked to identify the geographic feature.

4. Other images we would like for your students to work on before the videoconferencing event. The page will have a small thumbnail picture with a description of the picture. Click on the JPEG link to bring up a larger picture for your students to see on the computer monitor or print a hardcopy. The background information is for the teachers to see first and then you can determine how much of this information to give to your students.

   a. Earth's City Lights
      http://visibleearth.nasa.gov/cgi-bin/viewrecord?5826

   b. City Lights of Europe
      http://visibleearth.nasa.gov/cgi-bin/viewrecord?6529

   c. Washington D.C. Gray Scale
      http://visibleearth.nasa.gov/cgi-bin/viewrecord?368

   d. Washington D.C. Infrared
      http://visibleearth.nasa.gov/cgi-bin/viewrecord?5369

5. Once the students have had the opportunity to look at the pictures and analyze them, query the students about what they observed in the photos. Ask questions such as:
   a. What do you think this is a picture of?
   b. Do you recognize any of the features?
   c. What questions come to mind as you look at the picture?
   d. Is there something in the picture that you want to know more about?
   e. After studying the picture, what can you tell me about it?
   f. What do you think a geographer or an early scientist looks for in a picture like this?
   g. Would this be a good place for a city? Why?
   h. Are there problems with the environment in this area?
   i. What types of geographic features are located here?

Activity #3

WRITING ACTIVITY

Materials

- Pen or pencil
- Paper for writing
- Variety of images

Background

Prepare your students to be ready to share their interpretive skills during the interactive videoconference with NASA Johnson Space Center. Students will be shown an image and asked for their interpretations. The images will be comparing and contrasting features in the same area over time.

Procedure

1. To get your students thinking, verbalizing and interpreting effectively, have them write about two images. Comparing and contrasting, writing a story about the image, describing the image, etc.

2. Conclude class by informing students that they are now ready to participate in a live, interactive video teleconference with the NASA Johnson Space Center where astronauts train for missions aboard the International Space Station.

3. As a class, develop at least 5 questions associated with imagery that you would like to ask during the video teleconference and E-mail them to us at DLO1@jsc.NASA.gov or fax them to us at (281) 483-3789 at least 3 business days prior to your scheduled connection time. These questions should inquire beyond the basic information contained in the background materials and should demonstrate a “higher cognitive involvement” on the part of the students.

Presentation

Students will be asked to demonstrate their interpretive skills during the video teleconference.

Earth According to WORF
Pre/Post Event Quiz

1. **Write a definition for geography.**

2. **List three ways geographers might use information they gather from space based photography to answer questions about changes on the earth?**

3. **What is happening to our forests and rivers that will affect humans in the future?**

4. **What do the gray areas in satellite images generally represent?**

5. **What can you tell about this picture? What do the colors represent? (If you have a colored copy)**

Mississippi River Delta

NASA Event Guidelines

Review the following points with your students prior to the video teleconference event:

1. A video teleconference is a two-way event. Students and NASA presenters can see and hear one another.
2. Students are representing their school; they should be on their best behavior.
3. Students should be prepared to give brief presentations, ask questions and respond to the NASA presenters.
4. A Teacher(s) or other site facilitator should moderate students' questions and answers.
5. Students should speak into the microphone in a loud, clear voice.

Get Ready, Be Ready, and have fun with your Distance Learning Event with NASA!

Post-VTC Classroom Component

Post Event Follow Up And Assessment

1. Students and Teachers are welcome to e-mail the Distance Learning Outpost with any follow-up questions from the event at: mailto:DLO1@jsc.nasa.gov

2. We want to know where we excel and where we have room for improvement. Your candid and thoughtful reply will help with our evaluation. Most are able to complete the questionnaire in less than 10 minutes. Your response and any comments will be treated with utmost confidentiality. We welcome any input that you have at the following sites:

    - Teacher Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/distance_learning.html
    - Student K-3 Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/jsc_grades_K3_stud_fdbk.html
    - Student 4-12 Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/dlo_412_student.html
    - Technical Contact Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/jsc_dlo_tech_contact.html
    - Parent/Chaperone Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/distance_learning_parent.html

3. Please send us any photos, video, link to your school's/organization's webpage, newspapers articles, etc. of your event and we will be glad to post them on our webpage!

Extended Activities and Additional Resources

1. This website gets into other details you'll find in the images. Clicking on the images will open a page that will give you a lot of information. You will see the latitude and longitude of the sites as well other information. Students should practice looking at the images and analyzing them. Locate and label different details. Click on **Rotated Image** and then **Annotated Image** and the labels of the different details will appear. The students can see if their labels were correct. http://www.earthkam.ucsd.edu/public/students/activities/imageCaps/

2. Echo the Bat – This site offers a great interactive storyline with pictures to analyze. It is set up for the younger age students but can be a fun activity for all ages, too. http://imagers.gsfc.nasa.gov/

3. The Gateway to Astronaut Photography http://eol.jsc.nasa.gov/

4. Essay Activities http://www.tsgc.utexas.edu/essays/

5. Spacelink – Educational Resources
   http://spacelink.nasa.gov/Instructional.Materials/Curriculum.Support/Earth.Science/Geography/

6. NASA Explores has a great activities divided into the grade levels

    a. Hello Down There!
        i. (K-4) http://www.nasaexplores.com/search_nav_k_4.php?id=02-056&gl=k4
        ii. (5-8) http://www.nasaexplores.com/search_nav_5_8.php?id=02-056&gl=58
        iii. (9-12) http://www.nasaexplores.com/search_nav_9_12.php?id=02-056&gl=912

7. Exploring Remote Sensing and Electromagnetic Spectrum (Grades 9-12)
    a. This site takes you through a tutorial with more details about remote sensing, electromagnetic spectrum, satellite technology, etc. http://www.ccrs.nrcan.gc.ca/ccrs/learn/tutorials/fundam/chapter1/chapter1_1_e.html